

REMARKS

In the Office Action dated July 7, 2004, the Examiner took the following action: (1) rejected claims 1-2, 4-7, 9-13, 15-18, 20-24, 26-29, 31-35, 37-45, and 47-48 under 35 U.S.C. § 102(b) as being anticipated by Kerker *et al.* (U.S. 3,744,745); and (2) rejected claims 3, 8, 14, 19, 25, 30, 36, and 46 under 35 U.S.C. § 103(a) as being unpatentable over Kerker *et al.* Applicant respectfully requests reconsideration in view of the foregoing amendments and the following remarks.

In one embodiment of the present invention, an apparatus for reducing drag over an aircraft wing assembly includes a nacelle chine mounted on an outboard side of an engine nacelle adjacent a rearward swept portion of the wing. As best shown in Figure 2, *the nacelle chine extends greater than 25% of a length of the engine nacelle.* The nacelle chine is configured to reduce drag by redirecting at least a portion of fluid flow proximate a forward edge of the aircraft wing assembly such that a vortex is formed over the forward edge of the aircraft wing assembly. In a further embodiment, *the nacelle chine is mounted on an outboard side of the engine nacelle at an angular location that is greater than forty-five degrees from a vertical axis through the engine nacelle.* (Application, p. 7, lines 7-30; Figure 3).

Kerker *et al.* (U.S. 3,744,745)

Kerker *et al.* teaches a set of lifting vanes attached to the sides of a body which protrudes forward from beneath the wing of an aircraft. According to Kerker *et al.*, the vanes are shaped and located to produce a significant downwash field contribution in the region of the wing leading edge aft of the protuberance. Determined by measuring the vanes 24, 26 shown in Figures 1 and 4, according to the teachings of Kerker *et al.*, the vanes 24, 26 extend along the length of the engine nacelle by approximately 25% of the total length of the engine nacelle.

Furthermore, as best shown in Figure 5, Kerker *et al.* teaches that “the lift vanes 24, 26 are shown at approximately 45° from horizontal in the fore-to-aft view of the engine.” (2:46-48).

Kerker *et al.* fails to disclose, teach, or fairly suggest the apparatus taught by Applicant. Specifically, Kerker *et al.* fails to teach or fairly suggest an apparatus for reducing drag over an aircraft wing assembly that includes a nacelle chine mounted on an outboard side of an engine nacelle wherein *the nacelle chine extends greater than 25% of a length of the engine nacelle*. (Application, Figure 2). As shown in Figures 3 and 4, the vanes 24, 26 of Kerker *et al.* are directed to reducing the upwash of the flow over the wing in the proximity of the nacelle 22 at a nominal angle of attack of 20 degrees, thereby improving the lift of the wing during conventional takeoff and landing conditions (1:28-29; Figures 3 and 4) and allowing the aircraft to takeoff and land at reduced speeds (1:4-16). Because the apparatus of Kerker *et al.* is directed specifically to flight conditions having conventional angles of attack, there is no teaching or suggestion in Kerker *et al.* to lengthen the vanes 24, 26 beyond 25% of the nacelle length.

On the other hand, Applicant’s invention is directed to increasing a climb gradient of an aircraft during takeoff, therefore resulting in angles of attack during takeoff that exceed conventional values. At angles of attack greater than 20 degrees, the vanes 24, 26 of Kerker *et al.* suffer from reduced effectiveness because they are too short and do not divert a sufficient amount of the flow over the nacelle. Thus, the nacelle chine according to Applicant’s disclosure *extends greater than 25% of a length of the engine nacelle* (Application, Figure 2) in order to provide the desired vortex flow over the wing at such greater angles of attack, reducing the drag on the wing and providing increased climb gradients.

Accordingly, Kerker *et al.* fails to disclose, teach, or fairly suggest the apparatus disclosed by Applicant as specifically recited in claims 1, 6, 12, 17, 23, 28, 34, and 39, (and all other claims which depend therefrom), which recite that the chine *extends greater than 25% of a length of the engine nacelle*. Kerker *et al.* does not anticipate or render obvious Applicant’s invention because a chine of such extended length under the conditions of Kerker *et al.* would be

counter-intuitive and would add unnecessary weight to the aircraft, an undesirable characteristic for an aircraft.

Furthermore, Kerker *et al.* fails to teach or fairly suggest an apparatus for reducing drag over an aircraft wing assembly wherein *the nacelle chine is mounted on an outboard side of the engine nacelle at an angular location that is greater than forty-five degrees from a vertical axis through the engine nacelle.* (Application, p. 7, lines 7-30; Figure 3). Again, since Kerker *et al.* is directed to improving the lift of the wing during conventional takeoff and landing conditions (1:28-29; Figures 3 and 4) and allowing the aircraft to takeoff and land at reduced speeds (1:4-16), there is no teaching or suggestion in Kerker *et al.* to position the nacelle chine *on an outboard side of the engine nacelle at an angular location that is greater than forty-five degrees from a vertical axis through the engine nacelle.* Such positioning is adapted to provide the desired flowfield effects at greater climb gradients and angles of attack as taught by Applicant. The vanes 24, 26 of Kerker *et al.*, being limited to a 45 degree location, would become less effective at higher angles of attack as the flow over the nacelle tends to separate earlier from the nacelle surface, thereby rendering the vanes 24, 26 of Kerker *et al.* less effective. Furthermore, under the conventional takeoff conditions of interest to Kerker *et al.*, it would not be obvious to move the vanes 24, 26 to a lower radial position on the nacelle because at conventional angles of attack, this would increase the distance between the vanes 24, 26 and the leading edge of the wing, and possibly prevent the vortices 30, 32 from passing over the upper surface of the wing 12. Such a result would render the teachings of Kerker *et al.* unsuitable for its intended purpose. Accordingly, Kerker *et al.* also fails to disclose, teach, or fairly suggest this additional limitation as specifically recited in claims 2, 7, 13, 18, 24, 29, 35, and 43.

Finally, please note that Applicant has amended claim 5 to correct an informality noted therein, and claim 22 has been amended to conform to the amendment of its respective base claim.

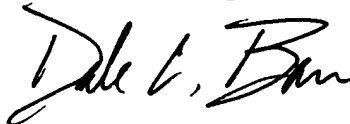


CONCLUSION

Based on the foregoing amendments and remarks, Applicant respectfully requests reconsideration and withdrawal of the rejections of Claims 1-48. If there are any matters that may be handled by telephone discussion, the Examiner is kindly requested to telephone the undersigned at his convenience.

Respectfully submitted,

BLACK LOWE & GRAHAM^{PLLC}



Dale C. Barr

Registration No. 40,498

Direct Dial: 206.957.2463

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BLACK LOWE & GRAHAM^{PLLC}



701 Fifth Avenue, Suite 4800
Seattle, Washington 98104
206.381.3300 • F: 206.381.3301